



Presupposition and accommodation

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Presupposition and accommodation*

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1 Introduction

A basic discovery of research in semantics, pragmatics and their interface is that the meaning of an utterance is not always a single, unified whole, but can be divided into different components of meaning. This chapter addresses one such division: the division between presupposed and asserted content. Whether this division aligns with that of semantics and pragmatics is a matter of controversy, with some theories pulling presuppositions more towards the semantic side while others considering them more as part of the pragmatic realm.¹ All theories of presuppositions, however, involve some combination of semantic and pragmatic elements in their account, making the presupposed/asserted content distinction one of the most emblematic phenomena of the semantic/pragmatic interface. The divide between presupposed and asserted aspects of meaning, originally observed by the German philosopher Gottlob Frege (Frege 1892), plays a role for the interpretation of an utterance in two ways. First, presupposed and asserted content can interact differently with other utterances in a discourse. Second, the presupposed and asserted content of parts of a complex utterance can also interact differently with other parts in the compositional build-up of utterance meaning. The division between these two types of content is, however, not as rigid as we would expect. In particular, in some cases, it is possible for presupposed content to acquire properties of asserted content. For these cases, an ‘Accommodation’ operation has been hypothesized and this is the second topic of this chapter. Evidence for Accommodation as well as for the division between presupposed and asserted content comes both from the discourse properties of complete utterances, and the compositional interpretation of complex utterances. In the remainder of this section, we introduce data from the discourse level. In the second section, we turn to evidence from complex utterances, and at the same time introduce the framework of Dynamic Semantics which arguably represents the most influential account of these data. In the final section, we discuss some important challenges to the Dynamic Semantics framework. As these later developments show, the research on presuppositions and accommodation remains one of the most debated topics in the semantics/pragmatics literature. Moreover, recently presuppositions have been investigated more and more with psycholinguistic methods, also in comparison to other semantic/pragmatic inferences like scalar implicatures. This experimental work has brought new important data in the theoretical debate and contributed even more to make this an exciting time to study these phenomena.

¹ The distinction between semantics and pragmatics is, of course, in itself controversial. A simple way to characterise the distinction is in terms of meaning encoded in words and morphemes and the way they are put together, on the one hand, and further inferences derived from the hearer by reasoning over the speaker’s communicative intentions; see Schlenker to appear and Stalnaker 2014 for discussion.

Consider a first piece of evidence for the division of presupposed and asserted content at the utterance level. As participants of conversations, we draw a variety of inferences from utterances. Imagine, for instance, to be in a situation in which you do not know that you have a sister; imagine further that you are told the sentence in (1-a) or that in (1-b). It is clear that in both cases you would equally conclude that you have a sister.

- (1) a. You have a sister and she is awesome.
- b. Your sister is awesome.

We also have the intuition, however, that this same piece of information is conveyed differently in (1-a) versus (1-b). For instance, it appears to be a natural and legitimate conversational move to object to (1-b) using (2). However, (the first part of) (2) appears to be an odd response to (1-a) (Shannon 1976, von Stechow 2008). That is, the type of discourse move in (2) appears appropriate only in response to (1-b).

- (2) Hey wait a minute! I didn't know I have a sister!

This difference tells us that the same inference — that the hearer has a sister — can have a different discourse status if drawn from a sentence like (1-a) versus one like (1-b). And this difference is one of the arguments for treating this inference as having different natures in (1-a) versus (1-b): if we can felicitously use a discourse move like (2) the relevant inference is considered to be a presupposition.^{2,3}

To illustrate this difference further consider a sentence like (3-a): from (3-a) we typically derive both the inference in (3-b) and that in (3-c). Again, however, the pieces of information in (3-b) and (3-c) appear to be associated with the utterance in (3-a) in different ways.

- (3) a. Jack stopped coming to class.

² In (1-a), the inference to that the hearer has a sister is simply an entailment (where entailment is standardly defined as follows: a sentence ϕ entails a sentence ψ iff whenever ϕ is true then ψ is also true). Notice that in the case of (1-b), it is standard to also assume that the inference that the hearer has a sister is an entailment, in addition to being a presupposition. This is because in this particular unembedded case it also exhibits some properties of entailments. Specifically, it is not suspendable, as (i) shows. Presuppositions, as we will see momentarily, are instead suspendable.

- (i) #Your sister is awesome and you don't have a sister.

³ Whether the *Hey wait a minute!* test really tests presuppositionality is controversial. Cases like (i) appear problematic in this respect (see Chemla 2008 and Romoli 2014 for discussion).

- (i) a. John is in NY and he is coming to visit tomorrow.
- b. Hey wait a minute! I didn't even know he was in the US!

- b. Jack doesn't come now.
- c. Jack used to come.

(3-c) represents presupposed content and (3-b) does not.⁴

One piece of evidence in this respect is that in the same way as above (4-a) is felicitous but (4-b) is not.⁵

- (4) a. Hey wait a minute! I didn't know that he used to come.
- b. #Hey wait a minute! I didn't know that he doesn't come now.

A second test can also be applied. This is based on explicitly asserting (3-b) or (3-c) before (4-a): in the case of (3-c) the result is felicitous, (5-a), but that of (3-b) is unnatural, (5-b).

- (5) a. Jack used to come to class and stopped coming.
- b. #Jack doesn't come to class now and stopped coming.

This again shows us that the inferences in (3-b) and (3-c) have different discourse status, despite looking similar on the surface. Information arising as a presupposition can be asserted before its corresponding presuppositional sentence, while that arising as entailment cannot. In other words, presuppositions, but not entailments, can be 'old information' in this sense. Notice, in passing, that an account for the oddness of sentences like (5-b) is also needed. The general idea in the literature is assuming an assertability condition on sentences, which requires a speaker not to assert something that is already (assumed to be) known by the participants of the conversation. In the case of (5-b), this condition is violated because the speaker asserts in the first part of the sentence what the second part also asserts (that Jack doesn't come to class at the moment). For different implementations of this idea see [Stalnaker 1978](#), [Fox 2008](#), [Singh 2007](#), [Schlenker 2009](#), [Katzir & Singh 2013](#), [Meyer 2013](#), [Mayr & Romoli 2014](#) among others.

Beyond words like *your* and *stop* presuppositions arise from a variety of other 'triggers.' One case discussed from very early on is that of definite descriptions: the observation is that a sentence like (6-a) presupposes something along the lines of (6-b) ([Strawson 1950](#) and much subsequent work).⁶

⁴ The inference in (3-b) is again simply an entailment of (3-a) as shown by the fact that (i) is contradictory (which in turn shows that when (3-a) is true then (3-b) must also be).

(i) #Jack stopped coming to class and he comes to class now.

⁵ As it is standard in the Literature, we will indicate unnaturalness/oddness with the diacritic '#.'

⁶ For recent work on definite descriptions see [Elbourne 2013](#), [Schwarz 2013](#).

- (6) a. The current president of Harvard is an historian.
b. Harvard has currently a president.

Other triggers include words like *win*, *also*, *again* or bound morphemes like that associated with number, gender, tense, and syntactic constructions like it-clefts. In (7) through (10) is a very partial set of presuppositional sentences in a, along with their presuppositions in b.

- (7) a. Jack won the Boston marathon.
b. Jack participated in the Boston marathon.
- (8) a. Yesterday, Jack showed up late again.
b. Jack showed up late before yesterday.
- (9) a. It is Jack who broke the vase
b. Somebody broke the vase.
- (10) a. The person over there introduced herself to the president.
b. The person over there is female.

As seen above, presupposed content can represent old information that is already known to the discourse participants. This observation is the starting point for the traditional approach to presuppositions. Specifically, this approach conceives presuppositions as not only allowed to be old information, in the sense above, but as *required* to be so. In particular, the idea is that a presuppositional sentence like (6-a) is only felicitous in contexts in which it is already assumed to be believed by the conversation participants that there is a president of Harvard. This approach, which stems from the work of Stalnaker (1973, 1974, 1978), Karttunen (1973, 1974), and Heim (1982, 1983), characterises presuppositions as constraining the class of contexts to which the presupposing sentence can be uttered felicitously. In other words, the presupposition of a sentence *S* must be ‘satisfied’ in a context for *S* to be felicitously asserted in that context. For this reason, this approach is sometimes called ‘the satisfaction theory of presuppositions.’⁷

To be more precise about how presuppositions are conceived in the satisfaction approach, we need to be more precise about how to model contexts. Following Stalnaker (1973, 1974, 1978, 2002); see also Stalnaker 2014, we can think of a context as determining, among other things, a common ground, a set of propositions that are believed to be believed by the conversation participants (if only for the sake of the conversations). A common ground is, in turn, associated with a set of worlds: the worlds compatible with each of the propositions in the common ground. In

⁷ It is standard to include in the satisfaction approach all theories that impose a condition requiring that the context entail the presuppositions of the asserted sentence. Therefore this approach includes a variety of other more recent accounts like Schlenker 2008a, 2009 and Fox 2008, 2012 among others.

Stalnaker’s terminology, this set of worlds is the ‘context set.’ For our purposes, we can identify a context with the context set it determines, so we will simply use the term ‘context’ in this way from now on. We can now go back to the idea above and define presuppositions as in (11).

- (11) A sentence *S* presupposes a proposition *p* iff for any context *c* in which *S* can be uttered felicitously, *c* entails *p*.

So for instance, (6-a) presupposes that there is a president of Harvard. In the satisfaction approach, this becomes a condition on the assertability of a sentence like (6-a): (6-a) is only felicitous in a context in which it is known (to be commonly known) by the participants of the conversation that there is a president of Harvard.

As you can imagine, one immediate question for this traditional approach is what happens if a sentence like (6-a) is uttered in a context in which it is not taken for granted that Harvard has a president. Indeed, we have the intuition that at least in some cases we could utter (6-a) in a context in which this information is not already commonly known. How can a case like this be reconciled with the satisfaction approach? The standard response, going back to Lewis (1979), is that this information, if not particularly controversial or relevant for the conversation, could just be accommodated in the context. Accommodation is a central component of the satisfaction approach to presuppositions and it has been conceived and implemented in different ways. For illustration here, we make use of an implementation based on presupposition theories like Krahmer 1998. Essentially, the idea is that accommodation is an operation, which we will call ACC, and which can apply to utterances or parts of utterances and transforms the presupposed content into asserted content (Krahmer 1998, Beaver & Krahmer 2001, Fox 2008,?, 2012, George 2008 among others). According to this implementation, a sentence like (6-a) is ambiguous: it could be analysed as in (12-a) and require the context to entail its presuppositions but it could also be analysed as in (12-b), where ACC transforms the presuppositions of its arguments in entailments. When analysed as (12-b), (6-a) could be paraphrased as *There is a current president of Harvard and the current president of Harvard is an historian*.⁸

- (12) a. The current president of Harvard is an historian.
b. ACC[The current president of Harvard is an historian]

In sum, we saw that certain inferences that we draw from utterances appear to have a characteristic discourse status; these inferences are considered to constitute the

⁸ Notice that while one could conceive the ACC operation to be a purely semantic operation, the decision as to whether interpret the sentence with or without ACC is pragmatic in nature. So here too we see a close interaction between semantic and pragmatic ingredients.

presupposed content of these utterances and are distinguished from inferences which arise from the asserted content. We also saw that when we conceive of presuppositions as requirements on the context of utterance, like in the satisfaction approach, we need to assume a process of accommodation, which allows presuppositions be accommodated in case they happen not to be old information in the context. We sketched a possible implementation of the accommodation process as insertion of an accommodation operator, which we called ACC. In the next section, we turn to the other argument for the division between presupposed and asserted content, which has to do with the compositional interaction of presuppositions in complex sentences.⁹

2 Projection & Dynamic Semantics

2.1 Projecting, Suspending, and Filtering

In the previous section, we considered the distinction between presupposed and asserted content at the utterance level. Now, we address the fact that presupposed and asserted content also exhibit distinct behavior in complex sentences. Recall that presuppositions are generally tied to the presence of a specific lexical trigger, e.g. the verb *stop* in (13) (repeated from (3-a) above). The data we turn to in this section concern sentences where such lexical triggers occur embedded in the scope of semantic operators. We will now introduce three distinct outcomes from such a case, following and adapting traditional terminology: the presupposition can 1) *project*, i.e. remain unaffected, 2) *be filtered*, i.e. be modified, or 3) *be suspended*, i.e. become part of the asserted content. To illustrate first a case of projection, consider the sentence in (13) and its inferences in (14-a) and (14-b).

- (13) Jack stopped coming to class
- (14) a. Jack doesn't come to class. (asserted content)
 b. Jack used to come to class. (presupposed content)

The observation is as follows: when we embed (13) under negation, (15-a), the antecedent of a conditional, (15-b), a question, (15-c), or a possibility modal (15-d), the inference to (14-a) does not survive, while that in (14-b) does. In other words, while (14-a) is only an inference of (13), (14-b) is an inference of both (13) and

⁹ Notice that in the satisfaction approach mentioned above, presuppositions are not considered primarily inferences, but more like felicity conditions on contexts of utterance. This notion, however, can also be reconciled with the idea of presuppositions as inferences that we draw from sentences. This is because the intuition of a presuppositional inference, in this approach, means that the presupposition was not already satisfied in the context, but that it was accommodated upon hearing the presuppositional sentence (see Chemla 2009c, Chemla & Schlenker 2012 for discussion).

all of (15-a)-(15-d). In the traditional metaphor, (14-b) projects out, when (13) is embedded in complex sentences like (15-a)-(15-d), while (14-a) does not.

- (15) a. Jack didn't stop coming to class.
- b. If Jack stopped coming to class, Mary won't be happy.
- c. Did Jack stop coming to class?
- d. It's possible that Jack stopped coming to class.

Explaining the behavior of presuppositions in complex sentences is also called the 'projection problem' of presuppositions. The projection problem is one of the main problems in the presupposition literature. The task is complicated by the fact that presuppositions do not always project out of embeddings. As mentioned above, there are in particular two cases in which projection does not happen and we illustrate them in turn.

The first type of non-projection, *suspension*, can be seen with cases like (16). What (16) shows is that the presupposition that Jack used to come to class does not project here, or it would be in contradiction with the continuation. In other words, (16) does not mean what the contradictory (17) means.

- (16) Jack didn't stop coming to class, because he has never come!
- (17) #Jack used to come to class and didn't stop, because he has never come!

The second type of non-projection, *filtering*, is illustrated by the cases in (18) and (19). While (18) is another case of projection out of embeddings (i.e., the presupposition of the consequent, that Mary has a brother, appears to project and become an inference of the conditional in (18)), this is not the case for (19).¹⁰ In other words, while you would conclude that Mary has a brother upon hearing (18), you certainly would not infer that from (19).

- (18) If Mary comes to visit, she will stay with her brother.
- (19) If Mary has a brother, she will stay with her brother.

Analogous patterns can be reproduced with other connectives like conjunction. Consider for instance (20-a)-(20-b): while we conclude that Mary has a brother from both (20-a) and (20-b), only in the case in (20-a) this inference is a presupposition.

- (20) a. Mary will come to visit and she will stay with her brother.
- b. Mary has a brother and she will stay with her brother.

¹⁰ See section 3.2 below for issues arising from presupposition projection from the consequent of conditional sentences.

To illustrate the difference between (20-a) and (20-b), consider the contrast in (21-a) versus (21-b): in line with the observations above about the discourse status of presuppositions and entailments, we can see that the inference that Mary has a brother behaves as a presupposition in (21-a) but not in (21-b). This is because this inference is allowed to be old information in (21-a) but not in (21-b).¹¹

- (21) a. Mary has a brother and she will come to visit and she will stay with her brother.
 b. #Mary has a brother and she has a brother and she will stay with her brother.

The question for presupposition theories is how to account for the cases in which presuppositions do not project, that is for cases in which they are suspended or filtered.

2.2 Accounting for projection and non-projection

2.2.1 Suspension as local accommodation

The concepts Accommodation and Non-projection are related. More specifically, cases of what we called *suspension*, could be thought of as the process of accommodation happening locally, when presupposition triggers are embedded in the scope of some semantic operators. As we saw, a sentence like (15-a), repeated in (22), has a reading in which the presupposition appears suspended, as in (16), repeated in (23).

- (22) Jack didn't stop coming to class.
(23) Jack didn't stop coming to class because he never came!

In the implementation of Accommodation presented above, complex sentences containing a non-projecting presuppositional trigger can be analyzed with an ACC operator in an embedded position. So for instance a sentence like (22) could be associated with either of the three structures in (25).

- (24) a. not[Jack stopped coming to class]
 b. ACC[not[Jack stopped coming to class]] (*global accommodation*)
 c. not[ACC[Jack stopped coming to class]] (*local accommodation*)

Whilst (24-a) involves simple projection of the presupposition that Jack used to come to class, the different scopes of ACC in (24-b) and (24-c) represent different

¹¹ Remember that the infelicity of (21-b) can be accounted for with the assertability condition mentioned above, requiring asserted information not to be entailed in the context of utterance.

ways in which the accommodation process can happen. The first case in (24-b) is a case of what we can call ‘global’ accommodation: since ACC applies after negation in (24-b), negation doesn’t apply to the presupposition that Jack used to come class. Therefore the unnegated presupposition becomes part of the asserted content as in the paraphrase (25).

(25) Jack used to come to class and didn’t stop coming to class.

On the other hand, in (24-c), accommodation happens ‘locally.’ As a consequence, negation applies after ACC, therefore the presupposition that Jack used to come to class is part of the asserted content that negation applies to. The interpretation of representation (24-c) is therefore one that is compatible with Jack never having come to class as paraphrased in (26).¹² This interpretation captures presupposition suspension and can be brought out if (15-a) is followed by ... *he has never come!* as in (23). In this approach, the problem of presupposition suspension becomes the problem of where the ACC operator should be merged.

(26) It’s not true that Jack used to come to class and stopped

However, this approach does not straightforwardly extend to the other case of non-projection, what we called *filtering* above. To illustrate, let us go back to the type of cases in (27-a) vs (27-b), repeated from above: where (27-a) involves projection of the presupposition of the consequent, but (27-b) does not.

- (27) a. If Mary comes to visit, she will stay with her brother.
- b. If Mary has a brother, she will stay with her brother.

To account for the contrast in (27) in terms of accommodation, one could stipulate that (27-a) should be analysed as (28-a), involving global accommodation, and therefore be equivalent to (28-b). Analogously, one could analyse (27-b) as in (29-a), involving local accommodation this time, so that it would mean roughly (29-b) and would correctly not give rise to the inference that Mary has a brother.

- (28) a. ACC[If Mary comes to visit, she will stay with her brother]
- b. Mary has a brother and if she comes to visit, she will stay with him.
- (29) a. If Mary has a brother, ACC[*she will stay with her brother*]
- b. If Mary has a brother, she has a brother and will stay with him.

¹² There is a well-known asymmetry between the accessibility of the global and local accommodation readings of a sentence. Recently, this difference has been experimentally shown in processing and acquisition experiments (Chemla & Bott 2013, Romoli & Schwarz 2014, Bill et al. to appear).

The question is, of course, why not the other way round. That is, the challenge for this approach is to tell us what prevents one to analyse (27-b) as (30-a), incorrectly predicting the meaning in (30-b) and the inference that Mary has a brother.¹³

- (30) a. ACC[If Mary has a brother, she will stay with her brother]
 b. Mary has a brother and if she has a brother, she will stay with him.

A second problem for an attempt to explain presupposition filtering by means of Accommodation is that the putatively accommodated content retains properties of old information. For instance, one question for this approach would be why (29-a) is felicitous contrary to (31), which is its corresponding meaning after ACC has transformed the presupposed into asserted content.

- (31) #If Mary has a brother, she has a brother and will stay with her brother

In sum, the idea of accommodating at different levels can account for the presupposition suspension cases, but not the cases of filtering, or at least not in a straightforward way.

In the next section, we discuss how filtering and projection are accounted for in Dynamic Semantics, a particularly successful theory, which is part of the satisfaction approach described above. Finally, we discuss some of the problems that have been raised for Dynamic Semantics at the beginning and in more recent years. Notice that, with respect to the initial Stalnakerian pragmatic characterisation of presuppositions, Dynamic Semantics pulls presupposition more into the semantics side of the semantics/pragmatics interface; a move which remains controversial (for criticism and discussion see [Stalnaker 2014](#), [Schlenker 2008a, 2009](#), [Chierchia 2009](#), [Rothschild 2011](#) among others).

2.2.2 Updating the context compositionally

Dynamic Semantics was build on the idea that the context of a conversation does not remain immutable, but changes dynamically as the discourse unfolds. In particular, any utterances, if accepted by the conversation participants, narrows down the set of possibilities that are open in the context. More precisely, following Stalnaker, we can model the way an utterance modifies a context with set intersection: for any context c and sentence S , the (felicitous) utterance of S in c produces a context c' which is equivalent to the intersection of c with the intension associated to S . In

¹³ One option to explore in this respect, following ideas in [Gazdar \(1979\)](#) and subsequent work in the DRT framework ([van der Sandt 1992](#), [Geurts 1996, 1999](#) among others), would be to have an interplay between the implicatures/appropriateness conditions of conditionals and presupposition projection. For discussion and criticism of this approach, see [Heim 1990](#), [Beaver 2010](#).

symbols, $c \cap \lambda w \llbracket S \rrbracket^w$ (where \cap is standard set-intersection and $\lambda w \llbracket S \rrbracket^w$ represents the intension of S - a function from possible worlds to truth-values). Dynamic semantics captures directly the notion of old information that we introduced above: after the successful utterance of a sentence S , any information S contributed is part of the new context c' . In a sequence of sentences such as (32), then, the information contributed by the first counts as old information for the second sentence, and thereby satisfies the presupposition.

(32) John used to come to class. Now he stopped.

Dynamic semantics extends the idea that a prior sentence provides a context for the evaluation of a later sentence to sentence internal interpretation. For example, it seeks to develop an account of the two examples in (33) where just as in (32) the presupposition of *stop* is satisfied by the initial clause.

(33) a. John used to come to class and now he stopped.
b. If John used to come to class, he stopped now.

Developing this intuition, Heim 1982, 1983 proposed to identify the meaning of sentences with the way they can change a context—i.e. their *Context Change Potentials*. Using this approach, she provided an account of when presupposition projects and when they are filtered. In the following, we illustrate the idea for the cases of conjunction and negation, but generalizations of the approach to several others connectives and operators are discussed by Heim (1992), Beaver (2001) and others.

First, dynamic semantics assumes that an embedded presuppositional sentence has no truth-value if uttered in a context that doesn't satisfy its presuppositions. Following for example Heim & Kratzer (1998), we model presuppositions a partial functions within the framework of model-theoretic semantics. Partial functions are neither true nor false in certain contexts, but undefined in the contexts where a presupposition is not satisfied. We adopt from Heim & Kratzer 1998 the notation in (34) for a partial function. The condition between the colon and the dot defines the domain of the function, while the term following the dot describes the value. Specifically, in (34) c is of type st , $|S_p|$ of type $\langle st, st \rangle$ and S_p is the sentence S that has p as its complete presupposition. (34) represents a partial function from contexts which entails S 's presuppositions to contexts in which S is true. Provided that $c \subseteq p$, the update of a context c with a sentence S_p is the intersection of c with the set of worlds that S_p is true in.

$$(34) \quad |S_p| = \lambda c : \underbrace{c \subseteq p}_{\text{domain}} . \underbrace{c \cap \{w : \llbracket S \rrbracket^w = 1\}}_{\text{value}}$$

So for instance, the meaning of a presuppositional sentence like (35-a), repeated from above, is a partial function from contexts which satisfy (35-a)'s presupposition (35-b) to contexts in which it is true that Jack stopped coming to class. Therefore, the result of updating a context c with (35-a) is shrinking c to the subset of c -worlds in which it is true that Jack stopped coming to class, provided that c entailed that Jack used to come to class in the first place.

- (35) a. Jack stopped coming to class.
 b. Jack used to come to class.

This basic condition in (35) captures the idea of presupposition as conditions on contexts by Stalnaker. So far we only looked at atomic sentences; when we move to complex sentences, we need an account of how the context change potentials of complex sentences is determined from those of their parts. The initial idea in Dynamic Semantics was that once we define, for each connective and operator, how they contribute to the composition of context change potentials, this will automatically derive when presuppositions project and when they do not. In other words, by defining how the assertion parts of sentences compose, we would derive how the presupposition parts do. We will come back to this claim in section 3.1. For now let's consider how, in the case of negation and conjunctions, this is accomplished.

Consider negation first. The effect of updating a sentence of the form 'not S ' to a context c is to subtract from c the worlds in which S is true. It is the way in which this is obtained, however, that is crucial for presuppositions: first we intersect the context c with S and then we subtract the worlds in the intersection from c . In other words, the operation in set theoretic terms is the following: $c - (c \cap S)$. What is crucial here is that the update of the context with *not* S contains in its specification the update of the context with S , in symbols: $|S|(c)$. The latter, in turn, will only be possible if the context presupposes all of S 's presuppositions. This last bit, therefore, correctly predicts that *not* S will inherit all of S 's presuppositions. The task for Dynamic Semantics is then to define the context change potential of *not* S in a way that adequately reflects our intuitions about its truth-conditions and presuppositions:

$$(36) \quad |\text{not } S_p|(c) = c - |S_p|(c)$$

(36) correctly predicts that (37-a) inherits the presuppositions of its positive counterpart, (37-b): that Jack used to come to class. Again, this is because updating the context c with $|\text{not } S|$ requires that we first update c with S . But as we know, this latter update requires S 's presuppositions to be satisfied. In this way, indirectly a negated sentence like (37-a) inherits all the presuppositions of its positive counterpart.

- (37) a. Jack didn't stop coming to class.

- b. Jack stopped coming to class.

Consider now the case of conjunction and let us go back to cases like (33-a), repeated from above. The relevant generalisation about (38) was that the presuppositions of the second conjunct are not projected to the whole conjunction if they are entailed by the information of the first conjunct. In other words, (38) doesn't presuppose what its second conjunct presupposes, that John used to come to class, because this is entailed by the first conjunct.

- (38) John used to come to class and now he stopped.

The task for Dynamic semantics is to define a context change potential of conjunction which can account for the just mentioned generalisation. In order to do so, the following definition of the context change potential of a conjunctive sentence is standardly assumed:

$$(39) \quad |S_1 \text{ and } S_2|(c) = |S_2|(|S_1|(c))$$

Definition (39) requires that in updating a context c with a conjunction S_1 and S_2 we first update c with S_1 and then we update the resulting context with S_2 . This immediately predicts that while S_1 is uttered in the context of c , S_2 is (as if it is) uttered in a derived context, call it c' , which corresponds to $c \cap \lambda_w \llbracket S_1 \rrbracket^w$. In turn, (39) correctly predicts that the presupposition of S_1 will have to be satisfied in c for S_1 to be defined, but that of S_2 only needs to be satisfied in c' . To illustrate these predictions with a concrete example, consider again the sentence in (38): according to (39), (38) can be uttered in any context, despite the fact that the second conjunct, *John stopped coming to class*, is presuppositional. This is because any context c updated with the first conjunct, *John used to come to class*, will entail the presupposition of the second conjunct (that John used to come to class). In other words, the presupposition of the second conjunct is correctly predicted to be filtered if the initial context updated with the first conjunct entails it.

The brief reconstruction above was just a sketch and there are a variety of details that one can implement in different ways. Moreover, one has to define systematically the context-change potentials of all connectives, modals, and quantifiers in a way that it links the projection properties of sentences and the way their assertion parts are composed. Once generalised in this way, however, the dynamic approach has been one of the most successful approach to account for the projection problem of presuppositions.

Before going to some challenges to this approach, it is important to notice that while it provides an account of presupposition projection and presupposition filtering, it still requires an extra mechanism to account for the cases of presupposition suspension like (40), repeated from above.

(40) John didn't stopped coming to class, because he never came!

The mechanism adopted is an implementation of Lewis' idea of accommodating presuppositions. However, rather than changing the sentence, like the ACC operator introduced above does, the idea is changing the context to which the sentence is updated. That is to say, the accommodation process acts on the context by modifying it so that it winds up entailing the relevant presupposition. Moreover, in parallel to how ACC can be merged at different levels in a sentence, this accommodation process can also apply at different levels. In particular, in the case of (40), a change is required not in the global context against which the entire sentence is uttered, but rather in a more local context, that of the sentential argument of negation. To illustrate, remember that the context change potential of negation for a sentence like *not* S_p was $c - |S_p|(c)$. This local accommodation process is assumed to apply before the $|S_p|$ is updated, so that the presupposition is satisfied in that local context. We can formulate this as in (41).

$$\begin{aligned}
 (41) \quad & |\text{not}[\text{John stopped coming to class}]|(c) \\
 & = c - |\text{John stopped coming}|(c) && \text{meaning of neg} \\
 & = c - |\text{John stopped coming}|(c \cap \lambda w[[\text{John used to come}]]^w) && \text{local acc} \\
 & = c - (c \cap \lambda w[[\text{John used to come}]]^w \cap \lambda w[[\text{John stopped coming}]]^w)
 \end{aligned}$$

More concretely, what happens is the sentence embedded in the scope of negation, John stopped coming to class, is updated to a context that is modified to entail the presupposition that John used to come. Negation then applies excluding worlds in which John used to come and stopped, so resulting in a context in which either never came to class or used to come and didn't stop. This context is then compatible with the continuation that John never came to class. Through this process of (local) accommodation, Dynamic Semantics can then account for data like (40).¹⁴

3 Extensions and Challenges to Dynamic Semantics

Though dynamic semantics has arguably been the most influential account of presupposition over the last 30 years, a variety of problems have been pointed out for the approach. In this section we review some of them and we point to the responses proposed in the literature.

3.1 Asymmetry of *and*

One important problem for Dynamic Semantics regards the relationship between how in a complex sentence the assertion and presupposition component of its parts

¹⁴ See von Stechow 2008 for a critical discussion of local accommodation in Dynamic Semantics.

are composed - which is just another way of saying when presuppositions project and when they do not. In particular, the problem has to do with the claim reviewed above that the projection of presuppositions can simply be derived by giving a truth-conditionally adequate formulation of how the assertion components of a sentence are put together compositionally . To illustrate the issue, let us go back to conjunction. Consider the sentences in (42-a) and (42-b), which presuppose that John has a sister and that she is in town, respectively. Now, consider the conjunction of (41-a) and (41-b) in (42).

- (42) a. John's sister is in town
 b. John discovered that she is in town.
- (43) John's sister is in town and John discovered that she is in town.

Recall that in defining the context change potential of (43) in terms of its parts in (42-a) and (42-b) we want to obtain two results. First, we want the net result to reflect our intuitions that a context updated with a conjunction of two sentences should be narrowed in such a way that any world in which either of the two sentences is not true should be discarded. In other words, we want the update of a context c with (43) to be just those worlds of c in which both (42-a) and (42-b) are true. That is, those worlds in which John's sister is in town and that John has come to know this. Moreover, intuitively, (43) still presupposes that John has a sister (the presupposition of (42-a)) but not that she is in town (the presupposition of (42-b)). So we want our definition of the context change potential to reflect this intuition.

The initial claim in dynamic semantics was that the presupposition projection properties of a complex sentence like (43) follow directly from defining a context change potential that is truth-conditionally adequate. For instance, the context change potential proposed for a conjunction of the form S_1 and S_2 is as in (44).

$$(44) \quad |S_1 \text{ and } S_2| = |S_2|(|S_1(c))$$

As seen above, (44) requires that we first update the context c with the first conjunct and correctly predicts that the presuppositions of the first conjunct have to be satisfied in c . As a consequence, the presuppositions of the first conjunct are correctly predicted to project to the whole conjunction. On the other hand, the second conjunct does not update the initial context c , but it rather updated c intersected with the first conjunct, call it c' . Thus this predicts that this derived context c' , not c , has to satisfy the presuppositions of the second conjunct. As a consequence, if the presuppositions of the second conjunct are entailed by the first conjunct, we predict that they will always be satisfied in c' , no matter what the initial context c is.

The explanation above appears to elegantly link how truth-conditions are obtained compositionally and presupposition projection. As [Soames \(1989\)](#), Irene

Heim herself (Heim 1990), and more recently Schlenker (2008a, 2009) have pointed out, however, when we look closely the link is not tight enough. This is because we can define a context change potential for a conjunction like (43) that is as truth-conditionally adequate as (44) (i.e., it narrows down the context in the same way), but it does not make the right prediction for presupposition projection. One example of this is (45): (45) is a simple variant of (44) above, but the two conjuncts are updated in a different order. The crucial point is that (45) still predicts that, in the end, the worlds of c that remain are only those compatible with both S_1 and S_2 . This makes (45) a truth-conditionally adequate.

$$(45) \quad |S_1 \text{ and } S_2| = |S_1|(|S_2(c)|)$$

However, the predictions of presuppositions are not adequate and are as follows: c should presuppose what S_1 and S_2 presuppose unless S_2 entails the presuppositions of S_1 . If these predictions were correct, a sentence like (46) should be natural and non-presuppositional, as the presupposition of the first conjunct should be filtered by the second one.

(46) #John's sister is in town and John has a sister.

On the contrary, (46) is odd.¹⁵ Its symmetric version in (47), on the other hand, is natural and presuppositionless.

(47) John has a sister and John's sister is in town.

This contrast is an argument for adopting (44) rather than (45). The problem is that they are truth-conditionally equivalent, therefore it is not true that presupposition projection is derived in Dynamic Semantics simply by adequately defining how the assertion component of sentences are to be put together compositionally.

This explanatory challenge for Dynamic Semantics has sparked an intense debate in the literature in recent years and triggered a variety of responses, departing more or less radically from the dynamic approach (see Schlenker 2008a, 2009, Fox 2008, 2012, George 2008, Chemla 2010, Rothschild 2011; see also Schlenker 2008b for a summary of the debate). Within the dynamic approach, Rothschild (2011) and Schlenker (2009) have proposed a way of constraining context change potentials that does not suffer from the explanatory problem above. We refer the reader to their papers for details, but in a nutshell the idea is that a sentence like (43) can be thought of being associated with both (44) and (45) but on top of this there is a general independent ordering constraint which favours the former over the latter.

¹⁵ The oddness of (46) can be explained if we consider that one presumably is forced to accommodate a presupposition that John has a sister in the global context, which makes the second conjunct redundant (cf. footnote 5).

This constraint can be implemented in different ways, but usually it is conceived as being based on linear order. The idea is that a sentence is processed incrementally as it is heard and it is this that creates an asymmetry between the conjunct coming first, the first conjunct, and the one coming last, the second conjunct (Schlenker 2008a, 2009). This, in turn, affects how presuppositions are filtered, in a more general and indirect way than in the dynamic approach, where the asymmetry is encoded directly in the meaning of connectives and quantifiers.

3.2 Conditional presuppositions

In this section, we put aside the problem of asymmetry discussed above, and we focus on the prediction of the dynamic approach for cases in which the presupposition trigger appears in the consequent of a conditional. We saw above that Dynamic Semantics predicts that the presuppositions of the second conjunct of a conjunction project unless they are entailed by the first conjunct. In other words, we could express the predicted presupposition of a conjunction of the form in (48) to be that the conditional presupposition that if q then p has to be the case.

(48) q and S_p

As we saw above, this correctly predicts that (49-a), repeated from above, presupposes nothing. More precisely, it only presupposes the tautological (49-b), hence it does not impose any restriction on the class of contexts in which it can be uttered.

- (49) a. Mary has a brother and she will come with her brother.
b. If Mary has a brother, Mary has brother.

On the other hand, the dynamic account predicts that (50-a) presupposes (50-b). But (50-b) appears too weak as it stands: intuitively, we would want to infer from (50-a) that Mary has a brother. The problem in this particular case, however, does not arise because the asserted conjunction in (50-a) *entails* that Mary doesn't want to come alone, therefore from the latter and the conditional presupposition in (50-b) we can indeed conclude that Mary has a brother. The combination of an entailment of the assertion and the conditional presupposition could be the source of our intuition that (50-b) gives rise to the inference that Mary has a brother.

- (50) a. Mary doesn't want to come alone and she will come with her brother.
b. If Mary doesn't want to come alone, Mary has brother.

When we turn to conditionals, however, the issue just sketched for conjunctions reemerges in a more problematic way. To illustrate, consider the corresponding conditionals of the two conjunctions above, in (51-a) and (52-a). It is easy to show

that the dynamic account predicts also in this case the conditional presuppositions in (51-b) and (52-b).

- (51) a. If Mary has a brother, she will come with her brother.
b. If Mary has a brother, Mary has a brother.
- (52) a. If Mary doesn't want to come alone, she will come with her brother.
b. If Mary doesn't want to come alone, she has a brother

While the prediction appears entirely correct for (51-a), it is clearly wrong for (52-b). Moreover, contrary from the case of conjunction, in the case of conditionals there is no entailment of the assertion that comes to rescue. That is to say, (52-a) does not entail that Mary doesn't want to come alone.

It is easy to construct a similar contrast involving a case in which the conditional presupposition appears correct, (53-a), or too weak, (54-a) (Perez-Carballo 2008).¹⁶

- (53) a. If Paul is a devout catholic, he will read his Bible tonight.
b. If Paul is a devout catholic, he has a Bible
- (54) a. If Paul is tired tonight, he will read his Bible tonight.
b. If Paul is tired tonight, he has a Bible

We are left with the problem that the predicted projected presupposition from the consequent of a conditional sentence appears correct in some cases, (53-a), but too weak in others, (54-a). This challenge to the dynamic approach is usually referred to as 'the proviso problem' - a term introduced by Geurts (1996, 1999). The task faced by the dynamic approach is to account for when a conditional sentence of the form if q and S_p should give rise to the weak conditional inference $q \rightarrow p$ and when it be associated to the stronger unconditional inference p .

The response to this problem is to derive the non-conditional presupposition on top of the conditional one, as a separate mechanism. Proposals along this line either derive the unconditional inference as an extra pragmatic inference on top of the weaker conditional presupposition or allow the accommodation component to directly accommodate the unconditional presupposition in certain contexts, see Karttunen & Peters 1979; van Rooij 2007, Perez-Carballo 2008, von Stechow 2008,

¹⁶ The conditional inference in (53-b) is a genuine presupposition in that it shows the discourse and projective properties outlined above in the introduction. First, it can be old information in the context, (i), and it appears to project from further embeddings like (ii) (Schlenker 2011).

- (i) If Paul is a devout catholic he has a Bible and if he is a devout Catholic, he will read his bible tonight
- (ii) If Paul is a devout catholic, will he read his bible tonight?

Heim 2006, Singh 2007, 2008, Schlenker 2011 among others; see also Romoli et al. 2011 and Chemla & Schlenker 2011 for related experimental work on presupposition projection in conditional sentences.

3.3 Differences among triggers

Theories of presuppositions like Dynamic Semantics traditionally treat all presuppositions uniformly. And indeed presuppositions do behave uniformly in most cases. For instance, consider the case of *win*. As seen above, a sentence with *win* like (55-a), its negation in (55-b), its questioned version in (55-c), and a conditional or a possibility modal embedding (55-a) like (55-d) and (55-e), all give rise to the inference that John participated in the Boston marathon.

- (55) a. Jack won the Boston marathon.
- b. Bill didn't win the Boston marathon.
- c. Did Bill win the Boston marathon?
- d. It's possible that Bill won the Boston marathon.
- e. If Bill won the Boston marathon, he will celebrate tonight.

If we consider any other presupposition trigger discussed above, we can reproduce the same projection behaviour. For instance, if we consider *it*-clefts, we can see that each of (56-a)-(56-e) give rise to the inference that somebody broke the computer in the same way.

- (56) a. It is Mary who broke that computer.
- b. It isn't Mary who broke that computer.
- c. Is it Mary who broke that computer?
- d. It's possible that it is Mary who broke that computer.
- e. If it is Mary who broke that computer, she should repair it.

In these examples, we observe that presuppositions behave uniformly in their projection behaviour through propositional connectives, modals, and questions as most approaches would lead us to expect. Despite their similarity, however, as discussed since Karttunen 1971 and Stalnaker 1974, there appear to be differences in the behaviour of certain triggers.

One first example of a difference in projection between triggers was discussed by Heim (1991), Sauerland (2008) and Percus (2008), who showed that in a number of cases two members of a pair with complementary presuppositions exhibit differences in their projection behavior. For instance, Sauerland (2003, 2008) discusses the difference between singular and plural marking of nouns. (57-a)/(57-b) show the presuppositions without projection: the singular variant presupposes that John has

exactly one sister, while the indefinite variant presupposes that he has more than one.

- (57) a. John invited his sister.
 \rightsquigarrow *John has exactly one sister*
 b. John invited his sisters.
 \rightsquigarrow *John has more than one sister*

(58-a)/(58-b) show the corresponding projection of the two triggers above from the scope of a universal quantifier. Projection of the presupposition of the singular results in the universal presupposition that every student has exactly one sister. The plural, however, projects to a weaker, existential presupposition, namely that at least one student has more than one sister.

- (58) Every student invited his sister
 \rightsquigarrow *Every student has exactly one sister*
(58) Every student invited his sisters
 At least one student has more than one sister

Similar contrasts obtain for other pairs of presupposition triggers that yield complementary presuppositions when they are not embedded.

A second example was discussed by [Abusch \(2002, 2010\)](#), who introduced a distinction between two classes of presupposition triggers that she refers to as ‘soft’ and ‘hard’ triggers. This distinction is based on two differences. The first difference has to do with the ease of suspension of the presupposition associated with a trigger. This can be brought about via creating a context in which the speaker is evidently ignorant about the presupposition; those triggers that do not give rise to infelicity in such contexts are soft triggers. Consider the following two examples modeled on [Abusch 2010](#) that show that according to this diagnostic *win* and *it*-clefts are soft and hard triggers respectively.

- (59) I don’t know whether Bill ended up participating in the Marathon yesterday.
 But if he won, he will celebrate tonight.
(60) I don’t know whether anybody broke that computer.
 #But if it is Mary who did it, she should repair it.

The second difference has to do with the projection behaviour in quantificational sentences. While as we saw the presuppositions of soft and hard triggers appear to pattern alike with respect to the projection behavior when embedded in connectives, modals, and questions, they behave differently when embedded in quantificational sentences. The gist of the observation, due to [Charlow \(2009\)](#), is that while hard presuppositions appear to project uniformly universally in quantificational sentences, the force of the projection inference of soft presuppositions depends on the quantifier

involved. So, for instance, if we consider *also*, which patterns like *it*-clefts in explicit ignorance contexts, we observe that all of (61-a)-(61-d) give rise to the universal inference that each of these students smoke something other than Marlboro.

- (61) a. Each of these students also smokes [Marlboro]_F.
- b. None of these students also smokes [Marlboro]_F.
- c. More/Less than three of these students also smoke [Marlboro]_F.
- d. Some of these students also smokes [Marlboro]_F.

On the other hand, when we turn to *stop*, which patterns with *win* in the suspension contexts above, we find a non-uniform behaviour depending on the quantifier involved. In other words, (62-a) and (62-b) give rise to the inference that each of these students used to smoke; (63-a) and (63-b), on the other hand, do not give rise to the same universal inference. This pattern has also been shown experimentally by Chemla 2009a.

- (62) a. Each of these students stopped smoking.
- b. None of these students stopped smoking.
- (63) a. More/Less than three of these students stopped smoking.
- b. Some of these students stopped smoking.

While the boundaries of the soft vs. hard distinction are controversial (see Abbott 2006 and Klinedinst 2010 for discussion), the division between weak and hard presupposition triggers is widely accepted (but see Abrusán 2014 for a recent criticism of the distinction). The challenge for dynamic semantics is to account for this difference in behaviour among presupposition triggers.

Several researchers have attempted to explain the division by different mechanisms by bringing soft triggers closer to implicatures. To illustrate the gist of the idea consider the sentence in (64-a) and its negative counterpart in (64-b). As seen above, the relevant data point to explain here is that both (64-a) and (64-b) give rise to the same inference in (65). In a traditional approach to presuppositions like Dynamic Semantics, this is explained by assuming that (65) is a presupposition of the sentence in (64-a), which then project from under negation in the case of (64-b).

- (64) a. Bill won the Marathon.
- b. Bill didn't win the Marathon.
- (65) Bill participated in the Marathon.

The recent approaches mentioned above would instead explain the fact that (65) is both an inference of (64-a) and (64-b) very differently: the idea is that first (65) is just an entailment of (64-b) and, second, (65-b) is an IMPLICATURE of (64-b) (*can*

we refer here another article about implicatures in the book?). In a nutshell, the implicature is derived by assuming that (64-b) and (66) compete with each other, in such a way that upon hearing (64-b) the hearer will conclude that (66) is false, thereby concluding (65) (=it's false that Bill didn't participate in the Marathon).

(66) Bill didn't participate in the Marathon.

By characterising the inferences of soft triggers like *win* in this way, these recent approaches hope to capture the differences between soft and hard triggers mentioned above; for discussion see [Chierchia & McConnell-Ginet 2000](#), [Simons 2001](#), [Abusch 2002, 2010](#), [Chemla 2009b, 2010](#), [Romoli 2014](#); for experimental work challenging this approach see [Chemla & Bott 2013](#), [Romoli & Schwarz 2014](#), [Bill et al. to appear](#).¹⁷

3.4 Differences among quantifiers

Filtering by quantifiers is perhaps the most difficult area of presupposition theory. Already [Heim \(1982, 1983\)](#) discusses a difference between universal and existential quantifiers illustrated in (67). Her claim is that universal quantification as in (67-a) projects the universal presupposition that all European countries cherish their king, the existential statement in (67-b) only projects the presupposition that the one relevant fat man has a bicycle.

- (67) a. Every/No European country cherishes its king.
b. A fat man was pushing his bicycle.

Part of the difficulty of this area has been to ascertain the basic data, [Beaver \(1994, 2001\)](#) disputes Heim's claim concerning universal quantification. Recently though, [Chemla \(2009b,a\)](#) corroborated and extended Heim's generalization through experimental investigation (see also [Sudo et al. 2011](#)).

In addition to differences between quantifiers, quantification and presupposition have been shown to interact in more complex ways. Consider the phenomenon [Sauerland \(2013\)](#) refers to as 'weakened projection.' Gender marking on bound pronouns generally exhibits a projection behavior similar to presuppositions as [Stechow \(2003\)](#), [Heim \(2008\)](#), [Sauerland \(2008\)](#) and [Sudo \(2012\)](#) discuss. For example, (68) leads to an inference that all the students are female.

(68) None of the students except Sue embarrassed herself.

¹⁷ For different takes on the soft-hard distinction see [Abbott 2006](#), [Klinedinst 2010](#), [Fox 2012](#) among others.

However, the same pattern doesn't obtain in (69) where the focus sensitive particle *only* is used to express quantification. This pattern has led to accounts where focus particle quantification differs in its interaction with presupposition from other quantificational operators.

(69) Only Sue embarrassed herself.

4 Concluding remarks

In this short paper, we could only scratch the surface of Presupposition and Accommodation, which remain widely studied phenomena in the semantics/pragmatics literature and related fields. For other introductions to Presuppositions and Accommodation see Beaver & Geurts 2011, Beaver 2001, Beaver & Zeevat 2007, von Stechow 2008. More recently, presuppositions have started being investigated through psycholinguistic methods more and more, for a recent survey of the different studies see Schwarz 2014.

word count: 7534

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